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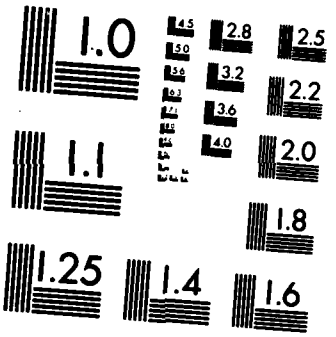

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NAVAL SUPPORT ACTIVITY HOSPITAL DANANG
COMBAT CASUALTY DEATHS JANUARY TO JUNE 1968

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Summary

Introduction

Studies of combat casualties have examined different aspects of the medical care system and the deaths that occurred while casualties were being treated. The purpose of this study was to describe various aspects of the casualties who died while being treated at the Naval Support Activity Hospital, Danang, South Vietnam, and to compare them with hospitalized casualties who survived.

Methods

A computerized surgical database with information on 2,021 male combat casualties admitted to the Naval Support Activity Hospital, Danang, South Vietnam between January and June 1968 was used in this study. These admissions were divided into three outcome groups: released alive, salvageable deaths, and non-salvageable deaths. The three groups were compared with each other using a variety of database variables.

Results

There were 1,962 (97.1%) casualties released alive, 42 (2.1%) salvageable deaths, and 17 (0.8%) non-salvageable deaths. The number of deaths per month ranged from 1 to 18. Altogether, 8,430 wounds were recorded for the 2,021 admissions. The mean number of wounds per casualty for each of the outcome groups was: 4.05 for released alive, 10.52 for salvageable deaths, 1.94 for non-salvageable deaths, and 4.17 for the entire group. For all admissions, lower extremity wounds occurred most frequently (40.5%), and all extremity wounds accounted for over half (68.2%) of all injuries recorded. When the distributions of wounds in the outcome groups were compared with each other, non-salvageable deaths had the largest percentage (66.7%) of head wounds. The group with the highest percentage of abdominal wounds was salvageable deaths (14.5%), compared to 6.4% for released alive and none for non-salvageable deaths. Follow-up information was limited to 1,182 Marines. Six of them died in military hospitals after their air evacuation from Vietnam. While no cause of death was identified, discharge diagnoses at the time of death indicated that four of the patients were septic.

Discussion

Many variables distinguished the outcome groups from each other. Non-salvageable deaths was the smallest group, and it had the smallest number of wounds per casualty, although many of them were penetrating head wounds. Salvageable deaths had more wounds per casualty and a higher percentage of penetrating abdominal wounds than any of the other groups. Whereas trauma was associated with the deaths that occurred in Vietnam, most of the deaths that occurred after the patients were transferred to a Western Pacific or continental (CONUS) United States hospital had diagnoses indicating sepsis.

Introduction

Studies of combat casualties undertaken during and after the Vietnam War have examined various aspects of the medical care system. Kovaric, et al. (1) studied wound check lists, identifying the number of wounded body regions and calculating mortality rates. Others have examined the causes of death (2,3), wounding agents (4), and clinical management (5,6,7). Hardaway (8) described an Army surgical research program in Vietnam that started in 1966. In 1967 another surgical research effort was initiated at the Naval Support Activity Hospital (NSAH), Danang. The Surgical Research Unit at this facility constructed a comprehensive surgical database (SDB) (9,10). Some of the variables in this data base included wounding agents, terrain where the injury took place, wound descriptions, certain aspects of treatment, and disposition. Additional information about the contents of the SDB and the methods used to construct it are found in other papers (9,10). The purpose of this paper is to describe various aspects of the casualties in the SDB who died while being treated at NSAH and to compare them to the hospitalized casualties who survived.

Methods

The SDB included information on 2,021 male combat casualties admitted to the NSAH Surgical Service between January and June 1968. There were 2,008 individual patients with 13 of them admitted twice during the six month period. Most of the casualties were Marine Corps enlisted personnel (N = 1,182); the remainder were Army enlisted personnel, except for a small number of officers and other service personnel (Navy, Air Force, and Coast Guard).

Casualties in the SDB were divided into three disposition groups: released alive (RA), salvageable deaths (SD), and non-salvageable deaths (NSD)(3). Casualties released alive were defined as those who were alive at the time they were discharged from NSAH. Salvageable deaths included casualties who died at NSAH while receiving treatment. These casualties may have had fatal wounds, but nonetheless, attempts were made to save them. Non-salvageable deaths included those casualties with wounds that were so severe that medical or surgical intervention could not have been expected to result in the casualties' survival, and who, consequently, were not treated. Deaths were identified in the SDB as those cases coded with a "1" for the variable indicating death. SD and NSD were differentiated on the basis of whether or not they were treated (NSD were neither given blood nor taken to an operating room).

After the three disposition groups were identified, frequencies for many of the SDB variables were calculated and compared for the three outcome groups. The death rates (percents of cases that died) were calculated using the following method. The number of SD and NSD were added together to find the total number of deaths occurring within each category, which was then divided by the total number of admissions in that category. For example, there were 15 deaths (SD, N = 11 and NSD, N = 4) and a total of 387 admissions during January (Table 1). The death rate was calculated by dividing 15 by 387, or 3.88%.

One-way analyses of variance comparing the three outcome groups were conducted for the number of casualties in triage and the number of days of hospitalization. Scheffe's specific-comparisons tests were conducted on these variables to determine which outcome group pairs differed significantly.

The coding method used by the Surgical Research Unit to indicate that something did not take place or that it was unknown was to leave it blank or code it as "0", "9", or "99". The category "Other Terrain" (Terrain of Injury) also was treated as missing data because specific types of locations could not be determined.

Results

Of the 2,021 admissions, 1962 (97.1%) were RA, 42 (2.1%) were SD, and 17 (0.8%) were NSD. Overall, 59 (2.9%) of the admissions died in the hospital. The number of NSAH admissions and deaths by month, the terrain where the injury occurred, and the cause of wound are presented in Table 1.

Month of Admission and Mean Length of Stay The total number of deaths per month ranged from 18 (February) to 1 (June). For NSD there were 3 to 4 deaths per month, except for June (N = 0). However, for SD the range was 1 to 14 per month. The death rate was highest in January (3.88%) and lowest in June (1.15%).

Terrain of Injury The category "Other terrain" was treated as missing data. Exclusive of this category, "Afoot-dry" had the largest number of total deaths (N = 22), but "Ground vehicle" had the highest death rate (3.51%).

Cause of Wound Excluding "Not Known", "Rifle/pistol" resulted in the greatest number of deaths (N = 14), followed by "Artillery/rockets/mortars" (N = 13). Considering the outcome groups individually, the greatest number of non-salvageable deaths resulted from "Rifle/pistol" (N = 8), and "Artillery/rocket/mortar" caused the greatest number of SD (N = 10). The death rate was highest for "Booby-trap grenade" (LF) (4.26%), which was similar to "Mine" (4.10).

Table 1

MONTH OF ADMISSION, TERRAIN OF INJURY, AND CAUSE OF WOUND BY DISPOSITION

	-Disposition- Released Alive	Salvageable Deaths	Non-Salvageable Deaths	Total Cases	Death Rate
Month of Admission	N	N	N	N	%
January	372	11	4	387	3.88
February	537	14	4	555	3.24
March	349	9	3	361	3.32
April	259	4	3	266	2.63
May	359	3	3	365	1.64
June	86	1	0	87	1.15
Total	1,962	42	17	2021	2.92
Terrain of Injury	N	N	N	N	%
Ground Vehicle	110	4	0	114	3.51
Aircraft	52	0	0	52	0.00
Afoot-Wet	275	3	0	278	1.08
Afoot-Dry	1,376	19	3	1398	1.57
Building	61	1	0	62	1.61
Missing Data	88	15	14	117	
Cause of Wound	N	N	N	N	%
Artillery/Rocket/Mortar	774	10	3	787	1.65
Booby Trap Gren. (LF)	45	2	0	47	4.26
Booby Trap Gren. (SF)	185	2	0	187	1.07
Burn	6	0	0	6	0.00
Grenade/BT/Mine/Other	32	0	0	32	0.00
Thrown Grenade	146	1	0	147	0.68
Rifle/pistol	467	6	8	481	2.91
Mine	140	6	0	146	4.10
Multiple	79	2	0	81	2.47
Missing Data	88	13	6	107	

For each disposition group, the distribution of the number of purple hearts received for previous combat, the number of casualties in the NSAH triage, admission hematocrit, units of blood used during initial surgery, and temporally-related variables are found in Table 2.

Months in Country This variable documented the number of months the casualty was in Vietnam at the time of his injury. The mean number of months in country was 5.59 for SD and 5.31 for RA. This information was not available for NSD.

Days on Combat Operation The mean number of days the soldier was on a combat operation when he was wounded was 4.33 for SD and 5.06 for RA. NSD had only 2 cases.

Purple Heart This variable indicated the number of purple hearts awarded for previous battle injuries. The mean for the SD (0.53) was more than three times that for RA (0.15).

Time From Injury to Admission The mean number of hours between the time the casualty was injured on the battlefield and his admission to NSAH was 2.83 hours for SD and 4.95 hours for RA. The mean time for NSD (2.72 hours) was similar to SD, but for both categories there was a considerable amount of missing data.

Number of Casualties in Triage The mean number of casualties in triage at the time of the index casualty's admission was greatest for RA (7.47), and this group also had the highest maximum number (N = 65). The means were about half as much for the other two groups (SD = 4.12, NSD = 4.00). A one-way ANOVA indicated that the mean number of casualties in triage on admission for the three groups differed significantly ($F = 5.4$, $p = .005$). A Scheffe's specific-comparisons test showed that the SD and the RA groups differed significantly at the .05 level.

Admission Hematocrit The admission hematocrit was determined while the casualty was in triage but usually only for those casualties appearing badly wounded. The RA mean hematocrit (39.0%) was within the normal limits of 38 to 54%. The mean was less for NSD (36.8%) and even less for SD (33.5%).

Time from Admission to Surgery The mean length of time from admission to NSAH until being taken to the operating room for surgery was 1.90 hours for RA and 2.88 hours for SD.

Units of Blood Used at the Initial Surgery The mean units of blood used during the initial surgery was 5.6 for RA and 11.9 for SD.

Number of Days Hospitalized The mean number of days of hospitalization at NSAH for RA (4.38 days) and SD (4.05) were similar, but the mean for the NSD was less (1.35).

Operating Room Utilization Casualties in this study were taken to an operating room or the orthopedic clinic (for minor surgery) and then admitted to the surgical ward, or in some instances, admitted directly to the ward. All 42 of SD and 1,172 (59.7%) of RA went to an operating room.

Wound descriptions were recorded in detail in the SDB. Altogether, 8,430 wounds were recorded for all 2,021 admissions (Table 3). For all admissions, lower extremity wounds occurred most frequently (40.5%), and extremity wounds accounted for more than half of all injuries recorded (68.2%). NSD had the largest percentage (66.7%) of head wounds of the three groups. The highest percentage of lower extremity wounds occurred in the RA (40.9%), followed by SD (36.9%) and NSD (6.1%). The group with the highest percentage of abdominal wounds was SD (14.5%), compared with 7.6% for RA and none for NSD. Using the data from this table the mean number of

wounds for each of the outcome groups was determined to be: 4.05 for RA, 10.52 for SD, 1.94 for NSD, and 4.17 for the entire group.

Table 2

A COMPARISON OF DISPOSITION GROUPS BY COMBAT EXPERIENCE AND HOSPITALIZATION-RELATED VARIABLES

Variable	Disposition	Mean	SD	Range Min	Range Max	Cases with Data	Cases Coded "0" or Missing	Total Cases
Months in Country	SD	5.59	4.90	1	21	17	25	42
	NSD	NA	-	-	-	1	16	17
	RA	5.31	4.12	1	34	1,860	102	1,962
Days on Operation	SD	4.33	7.47	1	30	15	27	42
	NSD	1.00	0.00	1	1	2	15	17
	RA	5.06	10.13	1	98	1,462	500	1,962
Purple Hearts	SD	0.53	0.74	0	2	15	27	42
	NSD	NA	-	-	-	1	16	17
	RA	0.15	0.42	0	3	1,825	137	1,962
Injury to Admission (Hours)	SD	2.83	3.55	0.5	12.8	30	12	42
	NSD	2.72	2.65	0.5	6.2	5	12	17
	RA	4.95	7.47	0.1	98.0	1,891	71	1,962
Number of Casualties in Triage on Admission	SD	4.12	4.26	1	20	42	0	42
	NSD	4.00	3.76	1	14	16	1	17
	RA	7.47	7.81	0	65	1,951	11	1,962
Admission Hematocrit (%)	SD	33.5	7.61	18	47	25	17	42
	NSD	36.8	8.30	30	47	4	13	17
	RA	39.0	5.14	14	51	818	1,144	1,962
Time From Admission to Surgery (Hours)	SD	2.88	7.25	0.4	48.5	42	0	42
	NSD	NA	NA	NA	NA	NA	NA	17
	RA	1.90	1.32	0.25	15.0	1,169	793	1.962
Units of Blood Used During Initial Surgery	SD	11.9	10.90	1	36	38	4	42
	NSD	0.0	-	0	0	0	17	17
	RA	5.6	6.60	1	51	478	1,484	1,962
Number of Days Hospitalized	SD	4.05	4.83	1	22	41	1	42
	NSD	1.35	0.79	1	4	17	0	17
	RA	4.38	4.86	1	52	1,950	12	1,962

Table 3

DISTRIBUTION OF ALL WOUNDS GROUPED BY ANATOMICAL CATEGORY *

Anatomical Category	Total Wounds N	Total Wounds %	Released Alive N	Released Alive %	Salvageable Deaths N	Salvageable Deaths %	Non-Salvageable Deaths N	Non-Salvageable Deaths %
Head	1,109	13.2	1,038	13.0	49	11.1	22	66.7
Neck	282	3.3	262	3.3	20	4.5	0	0.0
Thorax	614	7.3	590	7.4	22	5.0	2	6.1
Abdomen	573	6.8	509	6.4	64	14.5	0	0.0
Upper Extremity	2,333	27.7	2,210	27.8	116	26.2	7	21.2
Lower Extremity	3,417	40.5	3,252	40.9	163	36.9	2	6.1
Genitalia	102	1.2	94	1.2	8	1.8	0	0.0
Total	8,430	100.0	7,955	100.0	442	100.0	33	100.0

* This table includes all wounds for all admissions (N = 2,021).

The distributions of casualties with one or more penetrating wounds (head, thorax, abdomen, or combination) in each of the three outcome groups are found in Table 4. Overall, 22.6% of the admissions had at least one of these penetrating wounds. Penetrating wounds occurred to all NSD, 83.3% of SD, and only 20.6% of RA. Only 7 of the 59 deaths did not have a penetrating wound and

all seven were in the SD group. The death rate for non-penetrating wounds was 0.5% and for penetrating wounds it was 11.4%. Table 4 also has a breakdown of the combinations of various penetrating wounds. When the 456 penetrating wound cases are considered as a group, "Head and abdomen" (46.2%) and "Head and thorax" (42.9%) occurred most frequently. Most of the penetrating wounds for NSD were "Head only" (94.1%). It was determined that the wounding agents for the 16 NSD casualties with head wounds were: "Rifle/pistol" = 8, "Artillery/rockets/mortars" = 3, and "Not known" = 5. SD had a higher percentage of multiple penetrating wounds than did the other two groups (SD 37.9%, RA 10.6%, and NSD 5.9%). Additionally, 61.0% of all deaths had a penetrating head wound alone or in combination with other penetrating wounds.

Table 4

FREQUENCY OF CASUALTIES WITH PENETRATING AND NON-PENETRATING HEAD, THORAX, AND ABDOMINAL WOUNDS BY DISPOSITON

Admissions N = 2,021

	Released Alive		Salvageable Deaths		Non-Salvageable Deaths		Total Cases		Death Rate
Type of Wound	N	%	N	%	N	%	N	%	
Non-Penetrating	1,558	79.4	7	16.7	0	0.0	1565	77.4	0.5
Penetrating (one or more)	404	20.6	35	83.3	17	100.0	456	22.6	11.4
Total	1962	100.0	42	100.0	17	100.0	2021	100.0	2.9

CASUALTIES WITH ONE OR MORE PENETRATING WOUNDS

N = 456

Anatomical Sites	N	%	N	%	N	%	N	%	
Head only	151	37.4	11	31.4	16	94.1	178	39.0	15.6
Thorax only	69	17.1	3	8.6	0	0.0	72	15.8	4.2
Abdomen only	141	34.9	7	20.0	0	0.0	148	32.5	4.7
Head & Thorax	4	1.0	2	5.7	1	5.9	7	1.5	42.9
Head, Thorax & Abdomen	1	0.2	0	0.0	0	0.0	1	0.2	0.0
Head & Abdomen	7	1.7	6	17.1	0	0.0	13	2.8	46.2
Thorax & Abdomen	31	7.7	6	17.1	0	0.0	37	8.2	16.2
Total	404	100.0	35	100.0	17	100.0	456	100.0	11.4

Follow-up information on the casualties in the SDB was limited to a group of 1,182 Marines. Six Marines died in military hospitals after their air evacuation from NSAH. Five of them died at their initial transfer site. Of these five, three went directly to CONUS Naval hospitals, one went to the USS Repose, and one went to the Naval hospital at Guam. The remaining one went to Guam before being transferred to a CONUS Naval hospital. Their average length of stay at NSAH prior to transfer to another medical facility was eight days. The mean time from injury to death was 79.5 days (range 7 to 206 days). No cause of death was available, but Table 5 lists their discharge diagnoses. Two patients had septicemia, one had pneumonia, and another had abscesses.

Table 5

DESCRIPTION OF MARINE CORPS DEATHS OCCURRING AFTER AIR EVACUATION FROM VIETNAM

Case Number	Diagnoses
1	Injury to intra-abdominal organs, open Open wound of the back Contusion of face, scalp, and neck, with necrosis Cerebral paralysis
2	Encephalomyelitis Late effects of intra-cranial abscess Intra-cranial and intra-spinal abscess Deformity of musculoskeletal system and connective tissue Intra-cranial injury with foreign body Open wounds of upper limbs
3	Pneumonia
4	Open wound of upper limb Injury to nerves of wrist and hand Fracture of radius and ulna Injury to intra-thoracic organ, with necrosis Personality disorder
5	Septicemia
6	Injury to intra-abdominal organ Disease of esophagus Abscess of lung Septicemia Pleurisy

Discussion

Reports on combat fatalities distinguish between casualties who were killed in action (KIA) and those who died of wounds (DOW), the difference being whether the death occurred before or after reaching a medical treatment facility, respectively (3). The percent of combat casualties killed in action appears to have remained fairly constant, 20 to 25%, since the Crimean War (1854-1856) (11, 12). In contrast, the DOW rate, which is an indicator of the adequacy of combat care (3), did drop from approximately 22% in the Crimean War to about 3.5% in the Vietnam War, reflecting the improvements of modern medical science. However, despite these improvements, the DOW rate has not dropped significantly since World War II (WWII = 3.4%, Korea = 2.4%) (12). It has been argued (12) that perhaps the severity of wounds occurring in Vietnam was greater than in previous wars. If this were true, then the fact that the DOW rate has remained about the same since WWII is actually a reflection of improved combat casualty care. Another consideration is that the DOW rate in Vietnam may have been higher because of the rapidity with which casualties were transported from the battlefield to the hospital. Many of these casualties would have died in the field in previous wars. As an indication of this, one report (2) stated that 61.4% of the in-hospital deaths occurred within 24 hours. In the present study 2.9% of the admissions died in the hospital. However, if the NSD group is considered equivalent to KIA, then the DOW rate for the surgical service during this six month period was 2.1%. It should be noted that severe trauma cases were often sent to NSAH because of its surgical capabilities (2).

The number of deaths per month fluctuated considerably. This cannot be accounted for on the basis of any differences in the mean lengths of stay because they were fairly constant throughout the study period. That is, it could be hypothesized that a shorter length of stay would result in a more rapid turnover of patients, some of whom would be non-salvageable. Conversely, an in-

creased length of stay could have resulted in deaths in Vietnam that otherwise would have occurred in the continental U.S. or Western Pacific hospitals. Because this was not a factor, the monthly differences are more likely due to the type and intensity of fighting that took place at the time. The trend indicated by the death rate is that the greater the number of admissions, the greater percentage of deaths if all months are considered. One explanation is that more intense fighting resulted in more casualties and ones with wounds of greater severity. February was the month with the largest number of deaths and it coincides with the beginning of the Tet offensive, which started January 31 (13). The Tet offensive was similar to the large battles of WW II and Korea involving artillery and rockets. Much of the rest of the study period was characterized by smaller battles that involved the use of booby-traps and rifles and pistols. Additionally, it is likely that there was more fighting during the earlier part of the year, because it does not have the heavy rains associated with the spring and summer months which make it more difficult to fight. June had substantially fewer deaths and admissions than other months, this may reflect less complete data collection toward the end of the study.

The terrain of injury category with the greatest number of deaths was "Afoot-dry". This would be expected because the largest group exposed to combat was the foot soldier. But when the terrain of injury categories are compared with each other, "Ground vehicle" had the highest death rate, indicating a greater risk of having a fatality if injured in that setting. It is not known what type of vehicle(s) was involved in these deaths, but one of the authors (JG) recalled that attacks on armored personnel carriers sometimes resulted in secondary explosions within the vehicle resulting in severe injuries to its occupants due to burning fuel. The cause of wound category with the greatest number of deaths was "Rifle/pistol", but "Booby-trap grenade large fragment (LF)" and "Mine" had the highest death rates. This indicates that while more soldiers were wounded and died due to rifles or pistols, the risk of having a fatality within each of the wounding categories was greatest if it was due to a booby-trap grenade (LF) or mine. The death rate for the two types of booby-trap grenades were quite different, with LF being considerably higher. Because they were both used as booby-traps, it was most likely that differences were due to the construction of the two weapons. The large fragments were more likely to cause superficial wounds with considerable mangling, as compared to the small fragments which were more likely to cause multiple small puncture wounds and penetrate deeper.

The number of months in country and purple hearts awarded can be considered surrogate measures of combat exposure and experience. Although information on these variables was lacking for the NSD group, the results showed that the SD and RA groups were in Vietnam for a similar length of time, suggesting that this was not a factor influencing outcome. The SD group received a higher number of purple hearts. A possible explanation for this is that even though the two groups were in Vietnam the same length of time, the SD group had more combat exposure.

The mean number of days on operation was similar for SD and RA, indicating that this was not a factor influencing the outcome in the number of fatalities. The time from injury to admission was similar for SD and NSD but was longer for RA. This is a reflection of the medical evacuation system attempting to respond to the needs of the most seriously wound d first. The number of casualties in triage was likewise similar for SD and NSD but greater for RA, suggesting that there

were fewer casualties to have to deal with at the time that the more seriously wounded casualties who subsequently died were brought to the hospital. The reasons for this are not known, but the deaths would not seem to be the result of severely wounded casualties competing for resources at a time of maximum utilization. Additionally, it might be expected that because they arrived when there were fewer casualties in triage, the number of hours from admission to surgery would have been less for the SD than RA, but instead it was greater. This was most likely the result of SD having more severe wounds and needing extensive resuscitation efforts prior to being taken to surgery. As would be expected, the mean admission hematocrit was lower for SD than RA, and the mean units of blood used to the end of initial surgery was greater for the SD group, indicating severe wounding. Death occurred within the first day for most of the NSD, although it did reach four days for one casualty. The mean number of days hospitalized was about the same for the other two groups.

Medical data from World War II, Korea, and Vietnam have shown that the region of the body injured and the weapons used were among the most important factors influencing the probability of dying (14). Numerous studies (1,2,11,14) have reported that head wounds accounted for the greatest number of combat deaths, followed by thorax and abdomen. Penetrating wounds to these sites were associated with a much higher mortality rate than non-penetrating wounds (14). In contrast, extremity wounds had the highest incidence but were associated with a much lower mortality rate (1). Although the present study did not include the actual cause of death, the distribution of wounds for the outcome groups was generally in accord with the findings cited above.

The wound descriptions of the three groups were quite different. NSD had a large number of head wounds, few extremity and thoracic, and no abdominal wounds. The mean number of wounds per NSD casualty was less than the average for any other group. Thus, the NSD can be characterized as the group with the least number of wounds, but the site of their wounds (most likely causing irreparable neurological damage) was critical to their determination of being non-salvageable. SD had the highest percentage of abdominal penetrating wounds and the greatest number of wounds per casualty, indicating that as compared to the other two groups, the number of wounds was important. RA had the highest percentage of lower extremity wounds, and except for abdominal wounds, the distribution of other wounds was similar to SD.

Casualties with penetrating wounds considered as a group had the following characteristics: head wounds alone were associated with 27 of the 59 deaths and an additional 15 were combinations of head and some other penetrating wound. Thus, the importance of head wounds as pointed out in other studies is supported by the present study. Casualties with the combination of head and thorax or head and abdominal wounds were the most likely to die of all the casualties having penetrating wounds. The influence of body armor on the wounding patterns of these casualties is not known because there was no information in the surgical data base documenting its use. It is known, however, that flak vests and helmets were available but often went unused.

The Marine casualties identified in follow-up did not have a cause of death listed but the discharge diagnoses at the time of death suggest that sepsis was prominent. Viewed as a progression over time, the deaths in this study occurred first as a result of neurologic trauma due to

head wounds with no hope of survival on the outset, followed by deaths due to extensive trauma, and then deaths weeks or months later due to sepsis.

Conclusions

There are many factors that influence the medical outcome for soldiers wounded in combat. Many studies have looked at various factors individually, but the present study provides information on several factors. This may help to achieve a greater understanding of the overall situation.

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The purpose of this study was to describe various aspects of casualties who died while being treated at the Naval Support Activity Hospital, Danang, South Vietnam, and compare them with hospitalized casualties who survived. A computerized surgical data base with information on cambat casualties admitted to the Naval Support Activity Hospital, Danang, South Vietnam, between January and June 1968 was used in this study. Of 2,021 patients admitted during this period, 97% were released alive, 2.1% were salvageable deaths, and 0.8% were non-salvageable deaths. Non-salvageable deaths had the largest percentage of head wounds, and salvageable

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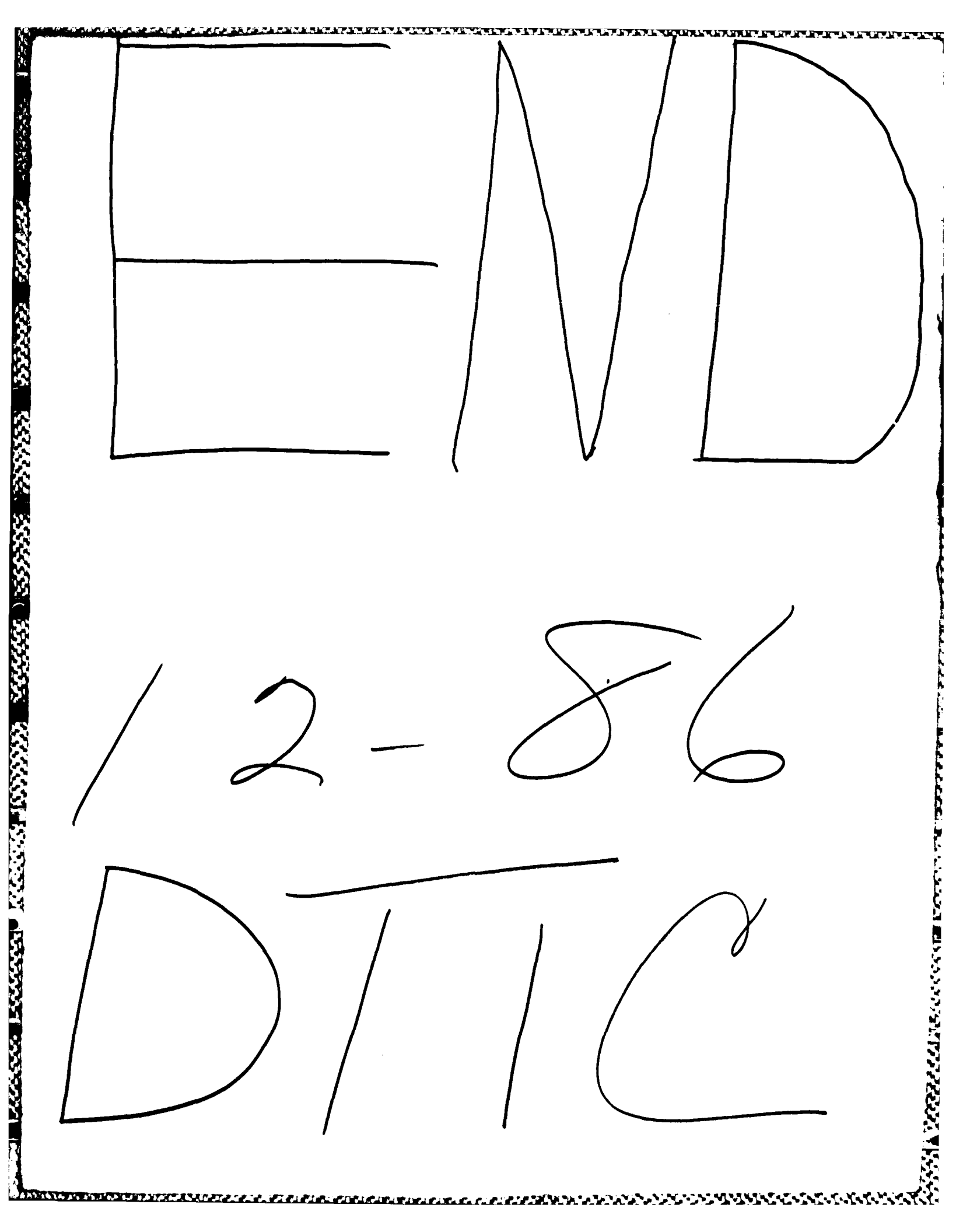
deaths had the highest percentage of abdominal wounds. Whereas trauma was associated with the deaths that occurred in Vietnam, most of the deaths that occurred after the patients were transferred to a western Pacific or continental U.S. Hospital was associated with sepsis. Reported Vietnam War.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